DIB's Recommendations for Digitization Can Help Tackle Diseases Like Coronavirus

The world's largest pathological tissue repository can provide researchers valuable data to combat infectious diseases.

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The Defense Innovation Board made recommendations to digitize the Defense Health Agency’s Joint Pathology Center samples and maximize sample data use in combatting diseases — from cancer to COVID-19 — at a meeting Thursday.

The center is the largest collection of human pathological tissue specimens in the world, with over 55 million glass pathology slides, 31 million paraffin-embedded tissue blocks and 500,000 wet tissue samples, collected over the past 100 years.
With that volume of information, DIB Member Michael McQuade said that digitizing the sample data can help researchers overcome barriers in accessing meaningful amounts of data to find solutions to diseases — even the COVID-19 coronavirus, McQuade added.

“If we have access to that data, the medical community is better able to identify and understand current and future disease,” McQuade said. “It enables the global community to better respond to future global health crises, and it promotes a better sense of health and wellbeing both in the DOD and in the federal population, so we see this as an amazing valuable resource, and then coupled with artificial intelligence, machine learning, things that the DIB has talked about for a very long time, only serves to amplify the value of that repository.”

Given the potential that researchers could reap from effectively archived JPC data, the board made a series of recommendations, including an initial multi-step pilot phase that will take place over the course of 12 months after the recommendations are adopted and a suggested long-term plan for DOD.

The pilot recommendation is three-pronged and recommends:

- The Defense secretary direct a pilot to scan large initial batches of slides as a foundation for implementing a longer-term plan to scan the full repository.
- JPC start assessing the ability to add value to the physical slide and tissue block collections by connecting a representative collection of slides to medical record information on a more automated and digital basis.
- JPC start assessing the ability to add molecular annotations to physical slides and tissue blocks to enhance their value for machine learning.

Board members stressed in their deliberation of the recommendations that JPC prioritize in these initial steps slides that are deteriorating most rapidly, as well as samples that are most valuable to combatting diseases that are most pressing to public health concerns.

The DIB’s long-term recommendations start within the first 12 months of DOD’s adoption of the recommendations, but extend well beyond the pilot. These recommendations focus on continuous scanning and digitization, as well as collaboration with relevant partners. There are three long-term recommendations:
DOD to develop a strategy to reduce the code of slide-scanning on an ongoing basis — with the initial goal of costs under $2 per slide — as well as a clear medical-records strategy and data strategy within the first 12 months of adopting a plan.

- JPC to launch a partnership plan that defines types of partnerships — such as in pathology, AI/machine learning or data storage expertise — and structures within the first 90 days.
- DOD to replicate all physical glass slides to digital formats with associated relevant medical records, as well as ethical and secure handling of personal health information, that is accessible to approved parties within five to 10 years of completing the pilot projects.

McQuade stressed the data strategy front of the long-term plan, adding that clarity around how JPC will organize and manage its data will impact disease data analysis and research driven by that data down the road.

“We need a clear data strategy ... to make it easy and productive to use the data and to make it accessible for not only AI/machine learning, but other forms of data analysis and we are suggesting that the JPC needs to work directly with the Defense Digital Service on that,” McQuade said. “What we learn in the pilot from this additional molecular annotation becomes a training mechanism for the machine-learning system so that we don’t actually have to do that on all the subsequent slides.”

All members of DIB approved the recommendations, which will next go to Defense Secretary Mark Esper for review and potential approval.

Aside from the JPC recommendations, DIB will within the coming months provide an update of its independent assessment of DOD’s progress on implementing software development and management — which DIB Member Richard Murray said is “positive” overall at the moment. DIB also supported the creation of a Chief Digital Engineering and Recruiting Management Officer position within DOD.

Last month DOD adopted DIB’s AI ethics principles and launched a Zero Trust Action Group to form best practices in zero-trust security. Last fall, DOD also named four military bases that will host 5G testing. These bases will include Naval Base San Diego, Joint Base Lewis-McChord, Hill Air Force Base and Marine Corps Logistics Base.